Evaluation of the Effectiveness of School Zone Flashers in North Carolina

Carrie L. Simpson, PE
Safety Evaluation Group
NCDOT Traffic Engineering

Current NCDOT Practice

Flashers are currently being placed on many school zone signs throughout North Carolina at the request of schools and in an attempt to bring more awareness to the speed limit signs.

Current NC Administrative Code states that *Standard signing and marking for school zones is the responsibility of the Department of Transportation. If an engineering investigation shows that hazardous conditions can be alleviated by the use of school flashers, then the Department of Transportation will install school flashers and maintain them.*

Is our investment paying off?

The Costs Add Up…

1997-2003 Spot Safety Funds were used to install 18 school zone flashers.

- Average Cost Per Installation = **$6000**
- Estimated Annual Maintenance Costs Per Site = **$500/YR**
- At least **128** sites installed from 1976 to present

--> Yearly Maintenance *Alone* for 128 sites = **$64,000**

Report Objectives

The evaluation summarized the effectiveness of placing flashers on school zone speed limit signs to improve speed compliance in school zones

Our objectives were to:

- Determine if flashers located in reduced speed school zones decrease speeds and increase speed compliance when compared to reduced speed school zones without flashers.

- Examine differences in vehicle speeds and compliance rates in school zones during reduced speed school zone hours of operation (school time) versus hours outside the reduced speed school zone hours of operation (non-school time).

Measures of Effectiveness

- Percent of vehicles exceeding the speed limit
- Average vehicle speed
- 85^{th} percentile speed
- Pace speed

Speed data measured in the morning and afternoon on typical weekdays when school was in session during:

- School Time at treatment sites,
- Non-School Time at treatment sites,
- School Time at comparison sites, and
- Non-School Time at comparison sites.

Sign and Flasher Assemblies

All treatment sites contained dual flashers that were either mounted on a pole on the side of the roadway (11 sites) or on span wire above the roadway (4 sites).

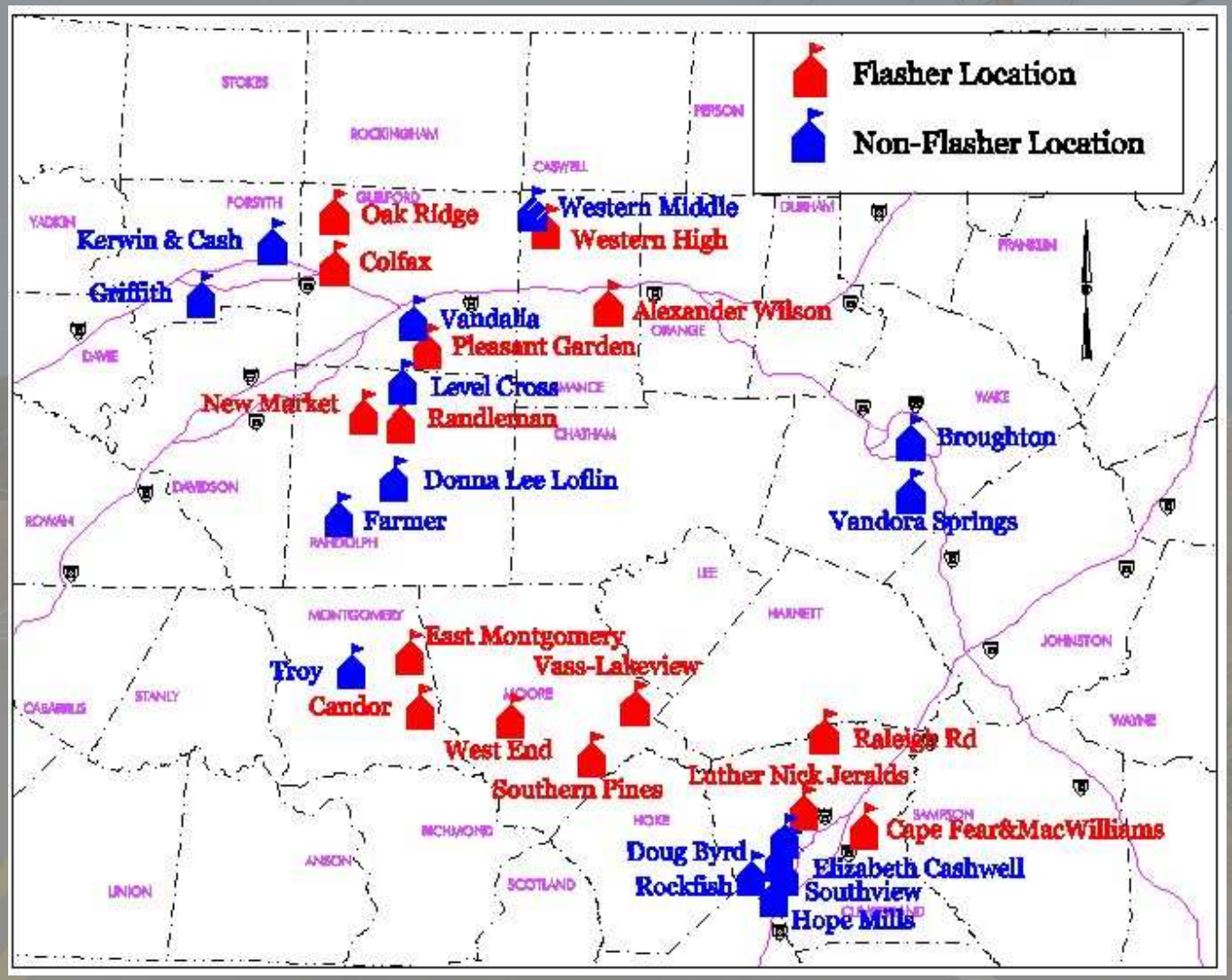
Site Selection

- Contacted Regional Traffic Engineers to create a statewide listing of candidate flasher sites
- Compiled a list of over 120 candidate flasher sites.
- Used the traffic ordinance system to identify comparison non-flasher sites that matched the treatment sites as closely as possible
- Scheduled field visits to locations that had been installed at least 3 years and were within a reasonable driving distance from Raleigh

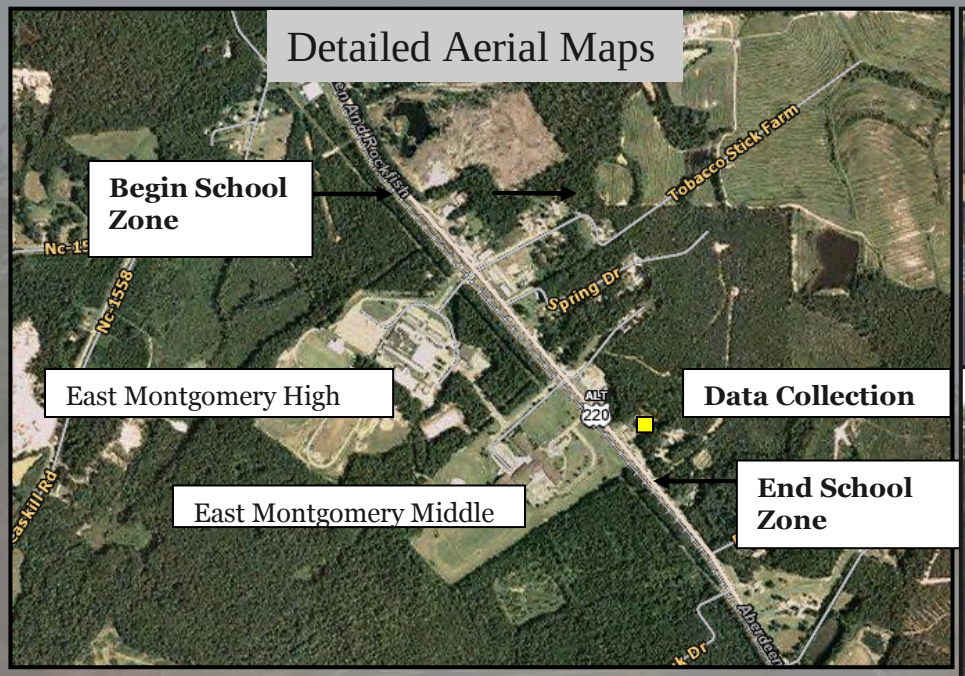
Site Selection

FINAL SELECTION:

- 15 treatment sites with flashers
- 15 comparison sites without flashers
- Sites with a mix of geometric and geographic features
- School time speed limits between 25-45 mph



Data Collection At Each Site



Morning School Zone Data Collection 7:30-8:30AM
Afternoon School Zone Data Collection 2:30-3:30PM

Data Summary - ST

	Morning ST		Afternoon ST		AVG ST	AVG ST
	SB	NB	SB	NB	SB	NB
Average Speed (mph)	45.7	46.5	45.3	44.3	45.5	45.3
85th Percentile Speed (mph)	52.2	53.1	52.4	50.7	52.2	51.2
Vehicles Exceeding ST Speed Limit (%)	93.6	98.1	94.7	88.3	94.3	92.9
Vehicles Exceeding Non-ST Speed Limit (%)	2.1	5.8	6.7	1.7	4.9	3.6
Total Observations	47	52	75	60	122	112

Comparison Sites

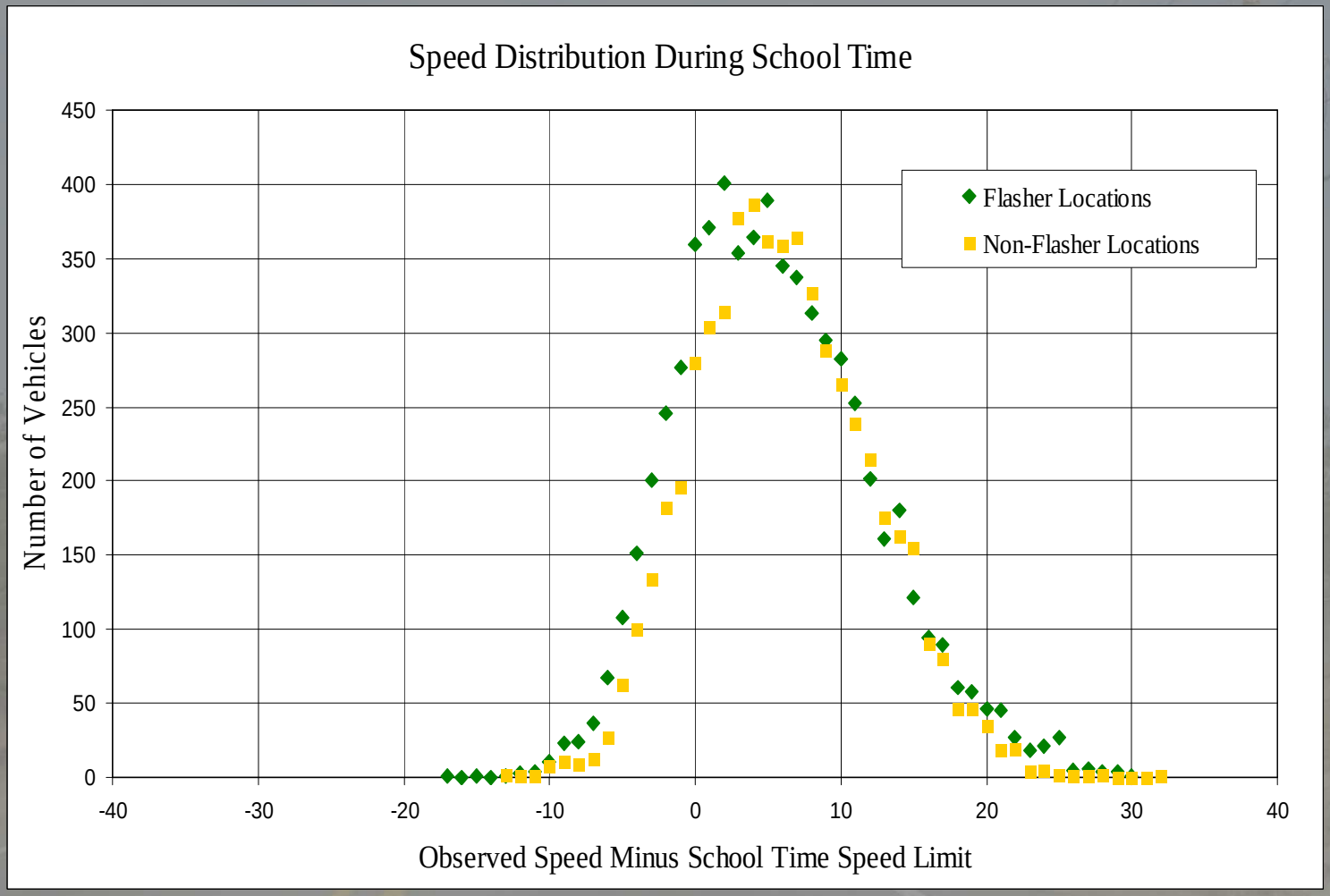
Speed data from the treatment and comparison sites were compared during non-school time hours to measure how similar the two groups operated.

Speed Data Collected During Non-School Time Hours
(With Speeds Referenced From the Non-School Time Speed Limit)

	Observations	Vehicles Exceeding Speed Limit	Average Speed Above (+) / Below (-) Speed Limit (mph)	85th Percentile Speed Above (+) / Below (-) Speed Limit (mph)	Pace Speed Above (+) / Below (-) Speed Limit (mph)
Flashers - Total	6020	46.20%	-0.1	+5.5	-5 to +5 (65%)
Flashers (25 mph ST)	2605	53.30%	+1.3	+7.0	-4 to +6 (65%)
Flashers (35+ mph ST)	3415	40.90%	-1.1	+4.4	-5 to +5 (65%)
NonFlashers - Total	5276	47.30%	0.0	+5.4	-5 to +5 (66%)
NonFlashers (25 mph ST)	2737	52.40%	+0.9	+6.4	-4 to +6 (64%)
NonFlashers (35+ mph ST)	2539	41.80%	-0.9	+4.3	-6 to +4 (69%)

The data shows that the treatment and comparison sites are similar, with the same speed distributions during non-school time hours.

Results - Flasher vs. Non-Flasher

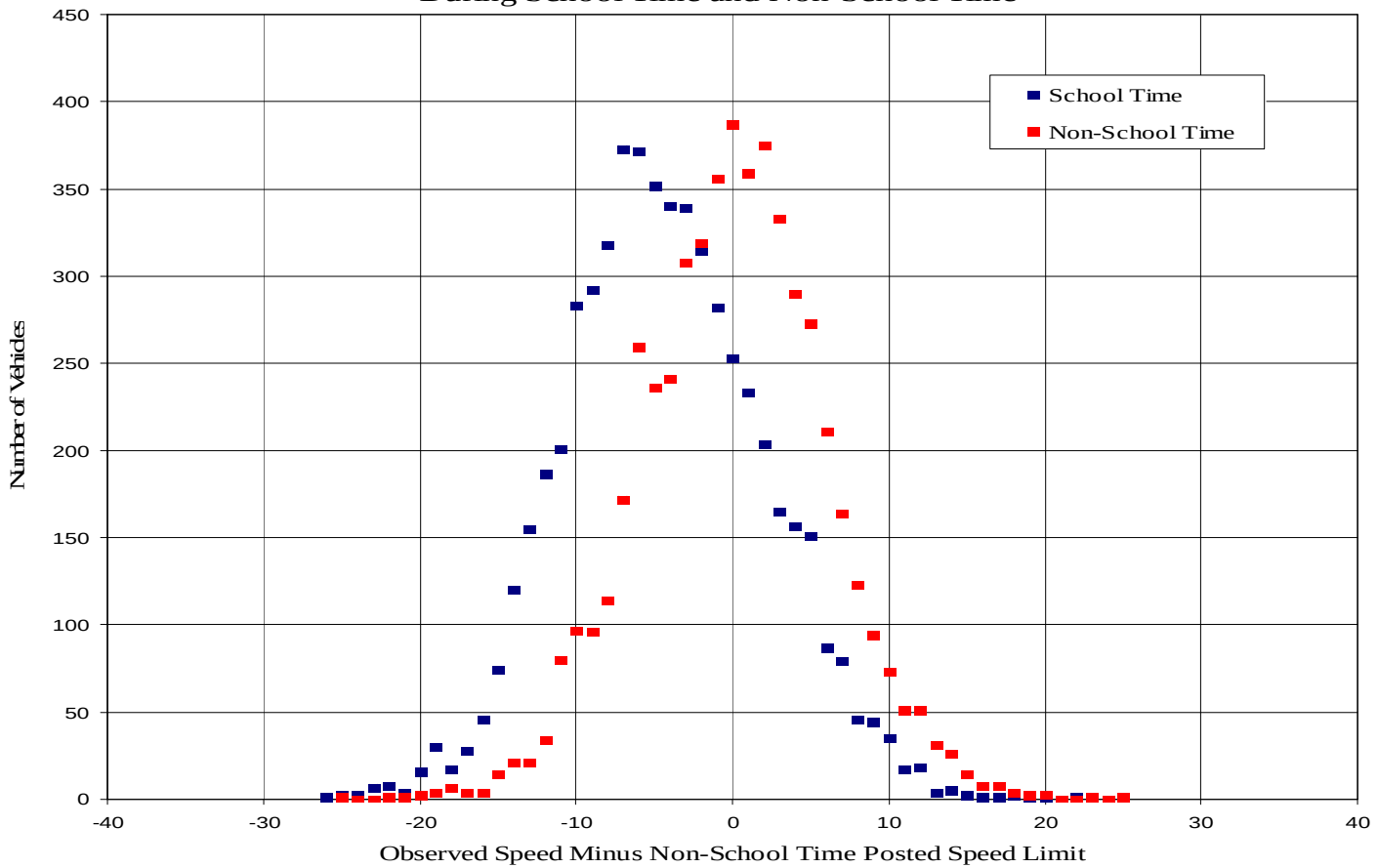


Similar Distributions & Low Compliance to Speed Limits	Non-Flashers	Flashers	Percent Difference
Vehicles Exceeding Speed Limit	81.9%	76.3%	-5.6*
Average Speed Above (+) / Below (-) Speed Limit (mph)	+6.0	+5.6	
85th Percentile Speed Above (+) / Below (-) Speed Limit (mph)	+12.0	+12.1	
Pace Speed Above (+) / Below (-) Speed Limit (mph)	0 to +10 (64%)	0 to +10 (64%)	

* Statistically Significant at the 95% Confidence Level Using t-test.

Results - School Time vs. Non-School Time At Non-Flasher Locations

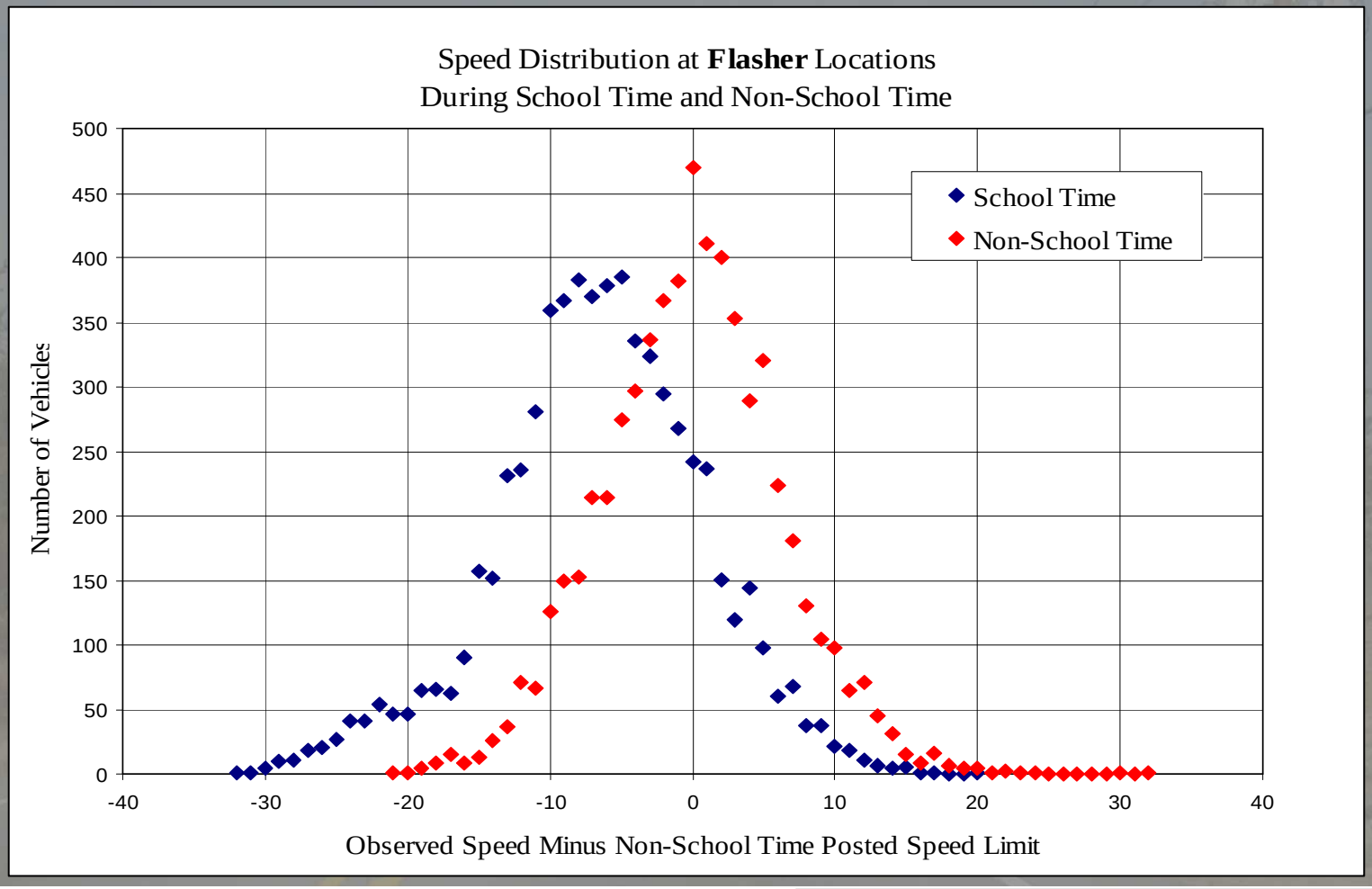
Figure 4. Speed Distribution at **Non-Flasher** Locations During School Time and Non-School Time



Shifted Distribution & Speed Decrease	Non-School Time	School Time	Percent Difference
Vehicles Exceeding Speed Limit	46.2%	16.0%	-30.2*
Average Speed Above (+) / Below (-) Speed Limit (mph)	-0.1	-6.5	
85th Percentile Speed Above (+) / Below (-) Speed Limit (mph)	+5.5	+0.3	
Pace Speed Above (+) / Below (-) Speed Limit (mph)	-5 to +5 (65%)	-11 to –1 (59%)	

* Statistically Significant at the 95% Confidence Level Using t-test.

Results - School Time vs. Non-School Time At Flasher Locations



Shifted Distribution & Speed Decrease	Non-School Time	School Time	Percent Difference
Vehicles Exceeding Speed Limit	47.3%	22.1%	-25.2*
Average Speed Above (+) / Below (-) Speed Limit (mph)	0.0	-4.4	
85th Percentile Speed Above (+) / Below (-) Speed Limit (mph)	+5.4	+1.8	
Pace Speed Above (+) / Below (-) Speed Limit (mph)	-5 to +5 (66%)	-10 to 0 (62%)	

* Statistically Significant at the 95% Confidence Level Using t-test.

Conclusions

- Flashers are **not** more effective at lowering speeds in school zones than signing and pavement marking alone.
- Regardless of flasher presence, average speeds during school time were above the school time speed limit but below the non-school time speed limit. This indicates that motorists were making an effort to reduce their speed during the school time, although the speed reductions were not enough to bring them into compliance with the school time speed limit.

Recommendations

NCDOT plans to adopt a policy that will no longer fund school zone flashers UNLESS they are warranted by a well documented engineering investigation.

School Flashers that are requested based upon complaints of speeding, informing motorists of school hours, or other issues not directly supported as a safety need in a documented engineering study should be funded by the School.

All costs to maintain and operate these flashers should be the responsibility of the School.

Recommendations

NCDOT plans to develop detailed guidelines for conducting school flasher studies to include the crash history, the speed distributions during school times and non-school times, and include evaluation of other countermeasures.

Implementing other methods to promote speed reduction in school zones may provide a greater safety benefit.

Questions?